# EXHIBIT 45

## Google Pixel 3 XL Teardown

Published: October 16, 2018

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#### TEARDOWN

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#### Tools Featured in this Teardown





#### Introduction

The Google Pixel 3 XL is all dressed up in the latest flagship phone uniform; glass on the back and a notch on the front. But we're headed past the shiny new facade, for a closer look at the insides. And there's only one way to get there—with a teardown!

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### Step 1 Google Pixel 3 XL Teardown

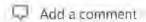


- Let's take a look at the tech that lies under the Pixel.
  3 XL's newly-notched exterior.
  - 6.3" OLED display with QHD+ 1440 \* 2960 resolution (523 ppi) and Gorilla Glass 5
  - Octa-core, 64-bit Qualcomm Snapdragon 045 processor (2.5 GHz + 1.6 GHz) with 4 GB LPDDR4x RAM
  - 12.2 MP, f/1.8, OIS main camera with dual pixel phase detection autofocus; dual 8.1 MP selfic cameras
  - 64 GB or 128 GB built-in storage
  - Ol wireless charging
  - IP68 water resistance.
  - Android 9.0 Pie





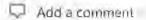
- Before diving inside, lets take a look at the sleel, exterior of the Pixel 3 XL alongside its smaller sibling.
- The new backing on these phones looks a lot like the hybrid cover from the last two generations, but this time around it's all a single piece of glass (with a partial matte finish).
  - Unfortunately glass is nowhere near as durable as aluminum, so we're hoping for an easy way to replace what will likely be a commonly-broken part.
- Turning to the front, we spy an extra camera sitting atop both displays.
  - That's right—while everyone else has been throwing more cameras on the back, Google turned around and added an ultrawide (19 mm equivalent) camera next to the existing wide angle (28 mm equivalent) camera.
- Exclusive to the Pixel 3 XL is a trendy little robot north that greets us as we turn on the phone.

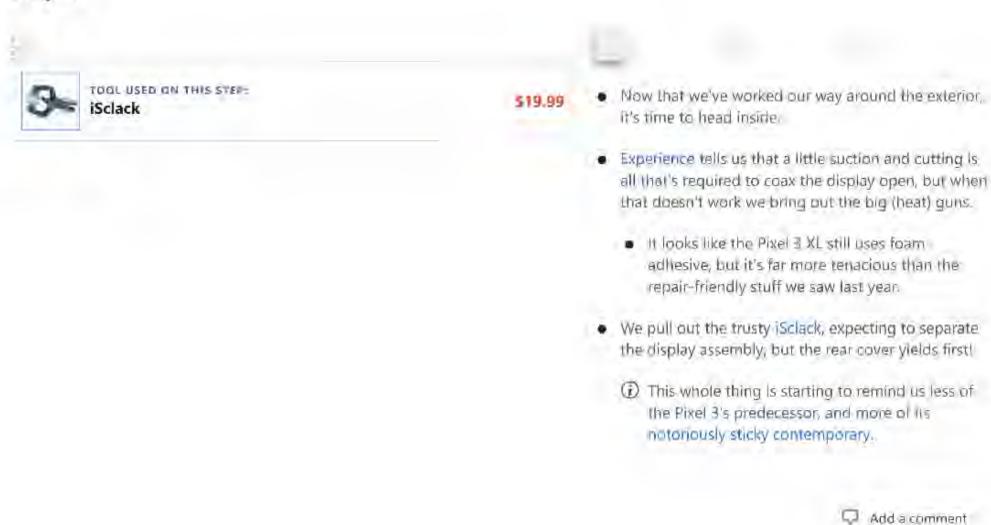


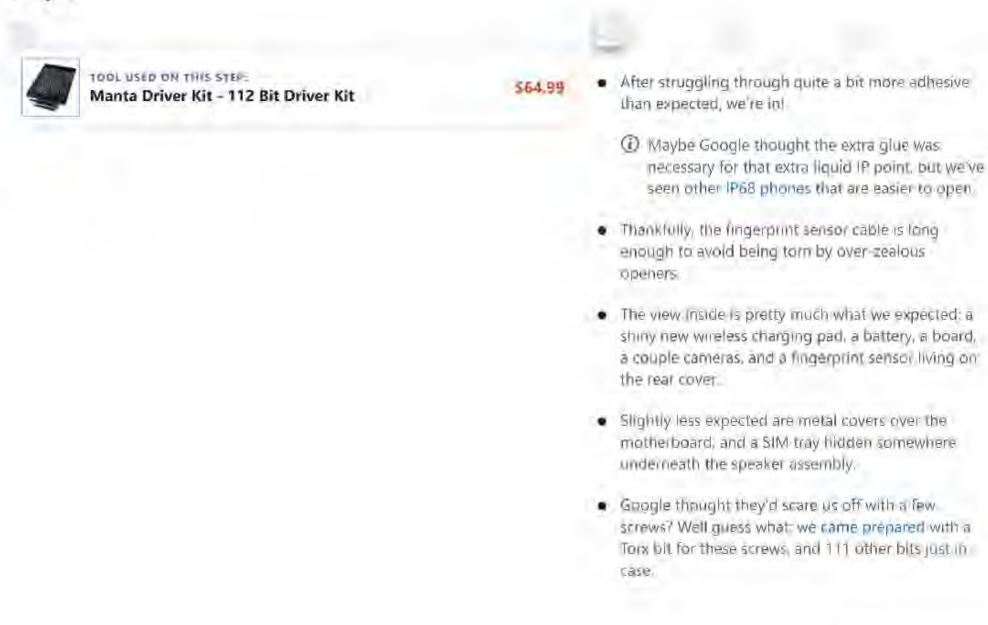




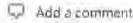
- The front-firing speakers on both Pixel 3's leave the aluminum frame devoid of any speaker grilles.
- Stacked together, it's obvious that one of these phones is a little more XL than the other, but there's not much difference otherwise.
- USB-C charging port, SIM card slot, and 80's themed power buttons are present and accounted for on both phones.







- The tough adhesive trend continues, holding the wireless charging coil to the Pixel's powerhouse. But we spy some respite!
- The battery is secured with relatively repair-friendly stretch-release adhesive. So you get at least one chance at easy removal, if your technique is right!
  - These strips didn't actually help us much, but the Pixel I had better luck.
- We resort to flossing out the battery and accidentally cut a fragile ribbon cable hiding underneath!
   Forewarned is forearmed—a repair manual would have helped us in this arena.
- Adhesive ordeals aside, the battery's out: the Pixel 3 XL is packing 13.2 Wh. That's actually down a smidge from the Pixel 2 XLs 13.6 Wh, and around the same as the original Pixel XL's 13.28 Wh.
  - The Pixel 3 XL still beats out the iPhone X5 Max (12.08 Wh), and comes close to the Galaxy 59+ (13.48 Wh).



Case 6:20-cv-00881-ADA Document 68-45 Filed 06/15/21 Page 10 of 22





- Above the crater where the battery once lay, we extract an antenna shielding the motherboard.
- On the south end of the phone, we battle some more adhesive to release what seems like just another shield.
  - Another trap! This shield is actually the speaker housing, which we just split in half trying to access the components underneath.
  - The speaker chamber is sealed with waterproofing adhesive, and that seal has to be broken to access any of the commonly-serviced ports on the daughterboard.



Step 8







- With its shields down, we can finally get a look at the newest Pixel's motherboard.
- As the board comes out, we can't help but notice generous helpings of thermal paste on its underside, to transfer heat from the hardest working chips to the metal frame.
  - It seems like a lot of paste, but powerful hardware produces a lot of heat.

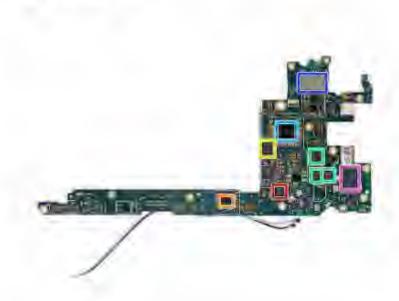






- All this glue has us tired—let's sit down for some chips:
  - Micron MT53D1024M32D4DT-046 AIT:D-4 GB LPDDR4X DRAM layered over Qualcomm Snapdragon 845
  - Skhynix H2857Q302BMR 64 GB NAND flash (universal flash storage)
  - Google SR3HX Pixel Visual Core (as seen in the Pixel 2 XL)
  - Qualcomm SDR845 RF Transceiver
  - Qualcomm QPM2622 and QPM2642 low and high band power amplifier module (PAMID)
  - Qualcomm QET4100 40MHz envelope tracker
  - Qualcomm PMI8998 PMIC







- Maybe just a couple more...
  - Google H1C2M Titan M security thip
  - IDT P9221 Qi wireless charging receiver.
  - Qualcomm WCD9340 Agstic audio codec
  - Qualcomm QDM3620, QDM3670, QDM3671
    Diversity Receive Modules
  - Qualcomm PM845 power management IC
  - Murata 1QB SS8601001, likely a WiFi module
  - Qualcomm QPM2635, likely a mid-band power amplifier module





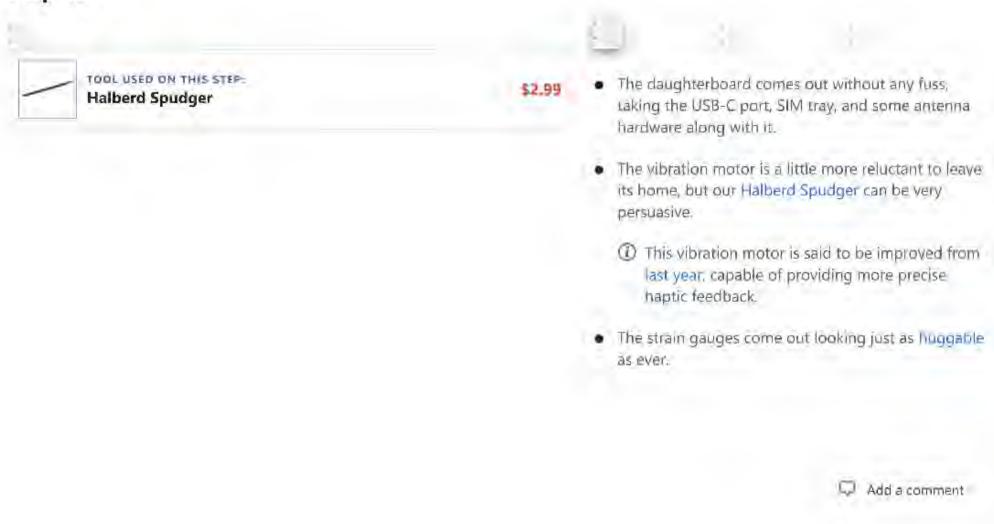


- Okay just a little more, we can't help ourselves:
  - Cirrus Logic CS40L20 audio amplifier
  - Bosch Sensortec BMI160 16-Bit, 3-Axis accelerometer/gyroscope
  - Bosch Sensortec BMP388 pressure sensor
  - Maxim Integrated MAX11261 24-Bit, 6-Ch, deltasigma analog-to-digital converter
  - Cirrus Logic CS35L36 audio amplifier
  - NXP Semiconductor PN81B NFC controller
  - Qualcomm PM8005 power management IC



- We carefully extract the left eyeball wide angle camera, which is lightly adhered to the frame.
  - According to Google, this extra camera will let you fit more of your friends into your selfies, which makes them . Group-ies?
- On the back, Google is again betting that Alican help a single sensor to do the work of two.
  - Based on early reviews, they may be right Word on the street is, this is a slightly upgraded Sony IMX363 sensor—the rest is up to the Pixel Visual Core.
- A Knowles MEMS microphone is also seen in the top center of the case









- In the name of science, we opt to dismantle our display to learn from whence it came, its defenses are strong, but no match for heat, patience, and a can do attitude.
  - At first, the frame's black border tricks us into thinking the display curves down to the frame. Future pryers, beware!
- Drumroll please.... It's a Samsung! Rumors were all over the place, but it looks like Google is going with Samsung's trusty AMOLED panels this year.
- Samsung's panels should be a little more reliable than last year's, but unfortunately this one comes. with a Samsung-esque repair process as well.
  - Replacing a Pixel 3 screen will be tricky, and will most likely require replacing the whole frame of the phone.
- Last, but not least, a display chip sitting alone on the display cable:
  - Samsung 56SY761X touch controller (a) teen on the 59+)

GigaDevice GD25LQ80 8 Mb serial flash memory

Add a comment







- Teardown Update: since you asked, we dissected the display in the smaller Pixel 3 as well. Guess what?
   This one's from LG Display!
- So it's a full reversal from the situation last year,
  where the Pixel 2 got a Samsung panel and its
  bigger sibling had a display from LG.
  - Rumor has it LG has been working hard to improve its OLED mobile technology—we're curious to see how their new display fares this year.





- Here are all the pretty parts that are packed into this Galaxy Pixel!
- Hungry for more teardown treats? The video team is here to please with the Pixel 3 video teardown!
- It seems like the Pixel has been hanging out with the troublemaking Galaxy line, leaving it with familiarlooking antenna assemblies, a stubborn battery, and a tough-to-replace display—manufactured by Samsung itself!
- Not only will swapping a cracked screen require a complete phone disassembly, but you've gotta think about the back now, too. The Pixel 2 XL rear glass covered 20% of the phone— the Pixel 3 XL's rear panel is 100% crackable. That doesn't bode well for repairability...

#### 

The only screws are standard T3 Torx fasteners.

Repair-friendly stretch-release adhesive secures the battery.

O-rings and adhesives for waterproofing complicate repairs, but make difficult liquid damage repairs less likely.

Display repairs are much more difficult than previous models, requiring complete disassembly of the phone.

To service any component, you'll have to painstekingly un-glue (and later re-glue) the glass rear panel.

Front and back glass means increased vulnerability to drop damage.



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43 COMMENTS

Add a comment



It's been numbered that the front stereo speakers are louder and more trisp than the ZXL. Is there a visual size difference in the speakers themselves?

Derek Champaune - 10/16/18-

The new speaker housing looks a little bigger and might be sealed better than the old one. I'm no speaker expert though, so I'm not shre how much of a difference the new design makes, or if the driver is just better.

Adam O'Camio - 10/16/18

